

THE EFFECT OF MINING AND BLASTING ON BREEDING PRAIRIE FALCON (*Falco mexicanus*) OCCUPANCY IN THE CABALLO MOUNTAINS, NEW MEXICO

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ABSTRACT - I surveyed 3 small isolated mountain ranges in southcentral New Mexico for the presence of breeding Prairie Falcons (*Falco mexicanus*). Of these, the Caballo Mountains were intensively impacted by mining and blasting activity, while the other 2 were essentially undisturbed. No falcons were found in the disturbed mountain range, but a total of 8 nests were documented in the 2 control ranges. The 3 areas were extremely similar in all respects except for the number of mining claims.

Almost no published information is available concerning the impacts of mining and blasting on birds of prey. The limited data available are restricted to observation of short-term impacts on actively nesting raptors (Stahlecker and Alldredge 1976). Several works (Allen 1979, Call 1979, Becker and Ball 1981) contain speculation about the impending impacts of mining operations on raptors and offer suggestions to minimize potentially adverse effects. Follow-up or controlled experimental studies of such impacts are virtually nonexistent.

Herein I report the numbers of breeding Prairie Falcons observed during a survey of 3 small and very similar mountain ranges in southcentral New Mexico. One of these ranges, the Caballo Mountains, has been intensively impacted by mining operations and associated human intrusions for several years. The other 2, the Fra Cristobal and Florida mountains, have minimal or no disturbance from mining. If mining and the associated blasting has no influence on Prairie Falcon nest occupancy, I would expect the numbers of breeding falcons at all 3 study areas to be similar. The habitat and number of cliffs at all 3 mountain ranges seems comparable.

STUDY AREAS AND METHODS

I surveyed the Fra Cristobal Mountains on 15-18 April and 19-23 May 1980, the Florida Mountains on 21-25 April 1980, and the Caballo Mountains on 5-9 May 1980. These ranges were searched for raptors as part of a larger statewide survey with emphasis on endangered raptors on lands administered by the Bureau of Land Management (BLM). These 3 ranges are isolated, but located in relatively close proximity (Fig. 1). The climate of all 3 ranges is similar; all are extremely dry with summer daytime temp often exceeding 38° C and winter temp commonly dropping below 0° C at night. The vegetation in all 3 study areas can be characterized as creosote bush (*Larrea tridentata*) dominated shrubland on the lower slopes grading into a sparse juniper-oak (*Juniperus* spp.; *Quercus* spp.) woodland on the summits and upper, north-facing slopes (Table 1). Elements of Chihuahuan desert vegetation (e.g. *Prosopis glandulosa*, *Yucca* spp., *Opuntia* spp.) are more common in the Florida Mountains. Suitable cliff habitat, elevation and topographic relief above basins are comparable for all 3 study areas (Table 1). Area of suitable cliff habitat (Table 1)

includes only that contiguous mountain habitat that contains cliffs potentially usable as nest sites. Foothill habitats without cliffs surrounding mountain ranges were not included in this area measurement.

Geologically, the Fra Cristobal and the Caballo mountains are nearly identical, consisting primarily of marine sedimentary rock resulting from an uplift along the Rio Grande Rift (Kelly and Silver 1952). The Florida Mountains differ in this respect as they are of a rhyolitic formation.

Field surveys in all 3 areas emphasized the most prominent cliffs, which in my experience are preferred by Prairie Falcons for nest sites. I have found that cliffs < 50 m in height are generally used only in New Mexico when larger cliffs are not available. During this study I examined numerous smaller cliffs (< 50 m in height) but none contained active Prairie Falcon nests. Surveys were accomplished by climbing to an observation point that allowed observation of 1 or more large cliffs (> 50 m of vertical or near vertical rock). I studied cliffs for falcon-like excrement ("whitewash") with binoculars and spotting scope and watched for falcon activity for periods of several hours as outlined by Bond et al. (1977) and Call (1978). Cliff observations were made in the early morning or late afternoon. After cliffs were watched for at least 2 h without success, I approached from below and attempted to disturb (by shouting and clapping hands) any previously unobserved raptor. Observations were discontinued at cliff sites when nests of the Golden Eagle (*Aquila chrysaetos*) or Prairie Falcon were located. Field examinations in all areas were conducted when falcons were expected to be incubating or possibly tending small young.

Accessibility of mountain ranges differed considerably. The Caballo range had numerous roads on talus slopes providing easy access to excellent observation perches close to prominent cliffs. On the other hand, the Fra Cristobal range was extremely remote and almost no roads approach the foothills. Although I spent nearly twice as many field days in this area, most of the additional time was used in travel. Access roads circled around the Florida Mountains, but generally stopped at the base of the talus. Search and observation effort at all 3 ranges was comparable (Table 2).

RESULTS AND DISCUSSION

I located 5 active Prairie Falcon nests in the Florida range and 3 active sites in the Fra Cristobal range (Table 2). No nests or large falcons were observed in the Caballo Mountains. I also found 2 Golden Eagle nests in the Fra Cristobal range. In all observable physical and ecological characteristics, except for the intensity of mining, the 3 mountain

Table 1. Characteristics of 3 mountain study areas in southcentral New Mexico.

	Fra Cristobal Mountains	Caballo Mountains	Florida Mountains
Approx. area of suitable cliff habitat (km ²)	36	26	34
Maximum elevation (m)	2083	2301	2270
Elevation relief above basin (m)	730	1000	915
Primary rock type	marine sedimentary	marine sedimentary	rhyolite
Dominant vegetation community on slopes	creosote shrubland	creosote shrubland	creosote-mesquite shrubland
Dominant vegetation community at summit	juniper-oak woodland	juniper-oak woodland	juniper-oak woodland

ranges appeared to be extremely similar (Tables 1 and 2).

The area I surveyed (26 km²) in the Caballo Mountains contained 125 active mining claims (mining claim records dt 21 June 1980, BLM State Office, Santa Fe, New Mexico). I witnessed blasting

during 1 of my 5 field survey days in this area. Numerous shallow shafts were blasted into rock walls and talus slopes throughout the range. These blast shafts were concentrated at or just above the base of both large and small cliffs examined. In addition, several ladders were bolted to the vertical

Table 2. Results of field survey for Prairie Falcon nests and active mining claims in 3 mountain study areas in southcentral New Mexico.

	Fra Cristobal Mountains	Caballo Mountains	Florida Mountains
Field days	9	5	5
Cliff observation (time h)	25.9	25.0	25.0
# of major cliffs examined (> 50 m in height)	10	8	9
# of major cliffs not examined (> 50 m in height)	3	3	4
# nests located	3	0	5
Mining claims recorded at BLM office	0	125	29
Mining activity observed	none	intense	none



Fig. 1. Location of 3 mountain study areas in southcentral New Mexico.

rock walls and 2 compressors were parked high on the talus slopes adjacent to cliffs.

In the Florida Mountains, with 29 mining claims in the area surveyed (34 km²), I observed no evidence of active mining. I did note 1 probable mining road leading up the talus slope on the north side of the mountain range. No evidence of mining activity was observed in the Fra Cristobal range.

The absence of nesting Prairie Falcons from the Caballo range was an unexpected finding. Prominent cliffs in the 2 control study areas provided habitat for 8 pairs of breeding falcons. Evidence of mining activity and related human disturbance was obvious in the Caballo Mountains, but minimal in the 2 control ranges.

Breeding falcons may have occurred in the Caballo Mountains in 1980, but if so, they must have occupied the smaller, less preferred cliffs. Given that I did not observe any Prairie Falcons, during the field survey, I suspect that few, if any, breeding falcons were present. No historical data on raptor breeding populations are available for any of the 3 ranges surveyed.

A possible alternative explanation is that low numbers of available prey made the Caballo range unsuitable as falcon breeding habitat in 1980. I feel,

however, this is unlikely because the Fra Cristobal Range 30 km to the north and the Florida range 90 km to the south provided enough prey to support at least 8 pairs. The vegetative cover in the vicinity of all ranges was extremely similar in all appearances. An absence of Prairie Falcons from the Caballo Mountains could only be caused by an extreme depression in prey populations in a very localized area around these mountains, which seems highly improbable.

The Florida Mountains were used by almost twice as many falcon pairs (5 vs 3) as the Fra Cristobal Mountains. This difference may be due to the dispersion of cliffs in the respective ranges. Prominent cliffs in the Florida range were uniformly distributed along the west face, whereas in the Fra Cristobal range, cliffs were aggregated in 2 relatively small parts of the range (1 aggregation in the north portion and the other in the south). The uniform cliff dispersion probably enables more falcons to use a small mountain range without intruding into defended areas around neighboring eyries. The cliffs in the Caballo range are distributed in a manner similar to that found in the Florida Mountains. Therefore, I would expect to find between 3-5 Prairie Falcon nests if the Caballo Mountains were undisturbed.

All raptors have individual differences in the amount of disturbance that will be endured. I am aware of 1 case in Wyoming where a pair of Prairie Falcons tolerated intensive coal mining activity including blasting, heavy equipment operation, and settling pond construction within 75 m of the nest (S. Platt, pers. comm.). Falcons returned to the same general area for 3 consecutive years (1981-1983) following the disturbance. These birds were not successful in producing young in any of the years monitored, but adverse weather conditions may have been a factor (S. Platt, pers. comm.). In this case the primary disturbance was limited to 1 breeding season and was apparently of similar intensity throughout the disturbance period. Tolerant falcons may more readily habituate to a steady, predictable intensity of disturbance. In contrast, mining and blasting activity in the impacted range surveyed during this study was probably of a highly variable and unpredictable nature.

Blasting and mining operations in the Caballo Mountains are primarily the endeavors of individual prospectors or small part-time mining partnerships. One larger corporation was mining barite at the time of my survey, but this mining was

in the foothills >3 km from the area of suitable nesting cliffs. Since the climate in this area is relatively mild and there are no restrictions on blasting, I assume that all active claims are worked periodically throughout the year. All mining in the survey area seemed to be on a part-time basis. Placer gold was probably the principle mineral that was being extracted. Also, much of the mining activity is suspected to be treasure hunting in search of legendary "Spanish gold" thought to be hidden in the Caballo Mountains (T. Custer, BLM Geologist, White Sands Resource Area; pers. comm.). Treasure hunters may pursue their hobby under the facade of a mining claim which allows them to legally blast natural cliff faces. The combination of mining and treasure hunting has resulted in an extremely high intensity of blasting in the Caballo Mountains.

In conclusion, I believe the data presented here suggest that there is a difference in Prairie Falcon nest occupancy between the Caballo Mountains and the 2 control ranges most likely due to blasting and mining or associated human activities. To my knowledge, no study has examined the long-term effects of mining or blasting on occupancy of raptor nest sites, but short-term impacts have been documented (Stahlecker and Alldredge 1976). Ellis (1981), based on a 2 y study of simulated sonic boom noise, implied that both adverse short-term and long-term impacts of such activities were probably negligible on nesting raptors. My results indicate that this conclusion cannot be extended to more intensive blasting and mining activities, and I urge further observation, and particularly, controlled experimental studies to address the long-term impacts of such disturbances on breeding raptors.

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